

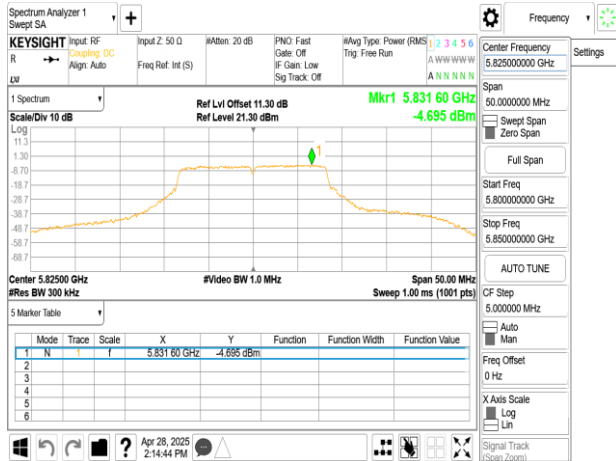
802.11a_20MHz_Chain0_5785MHz



802.11n_20MHz_Chain0_5220MHz



802.11a_20MHz_Chain0_5825MHz



802.11n_20MHz_Chain0_5240MHz



802.11n_20MHz_Chain0_5180MHz



802.11n_20MHz_Chain0_5260MHz



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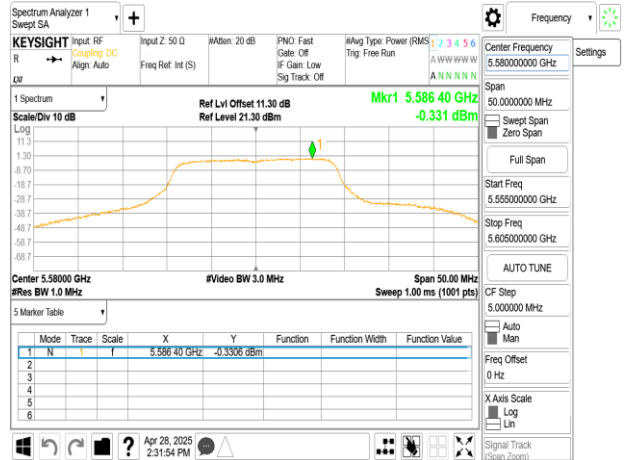
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802.11n_20MHz_Chain0_5300MHz



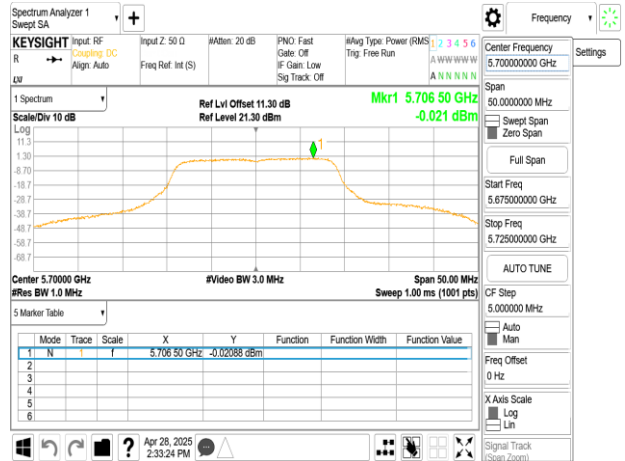
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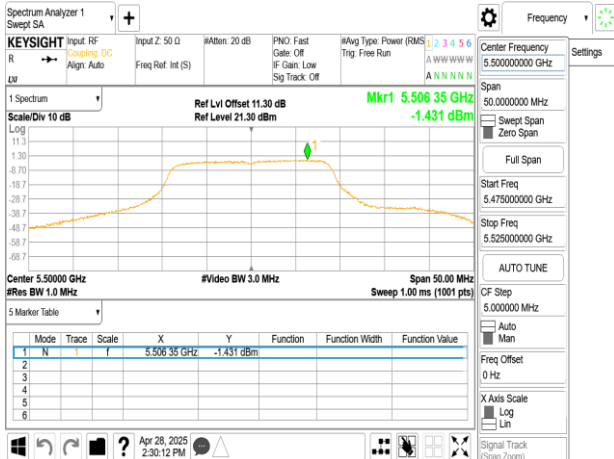
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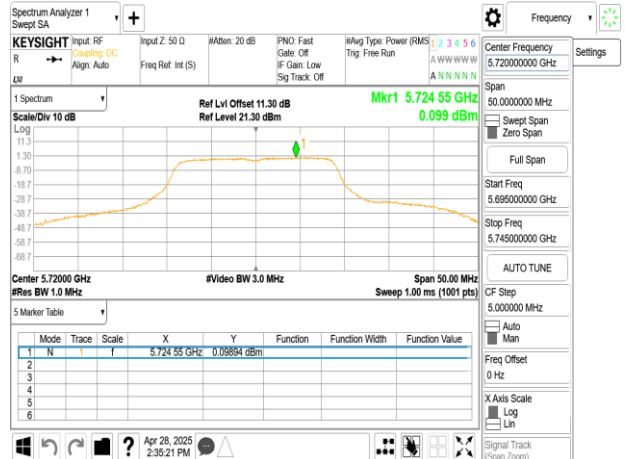
802.11n_20MHz_Chain0_5700MHz



802.11n_20MHz_Chain0_5500MHz



802.11n_20MHz_Chain0_5720MHz_UNII 2C

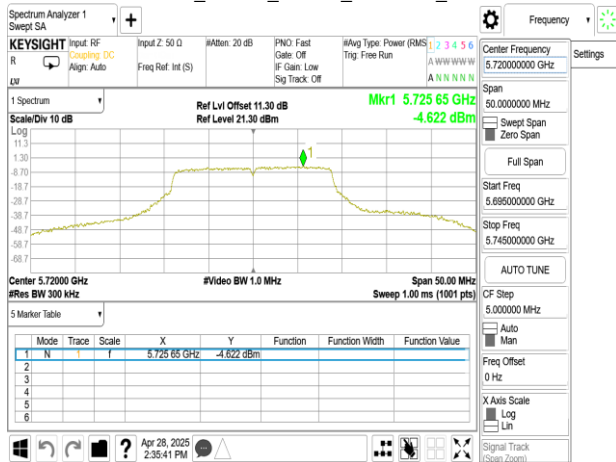


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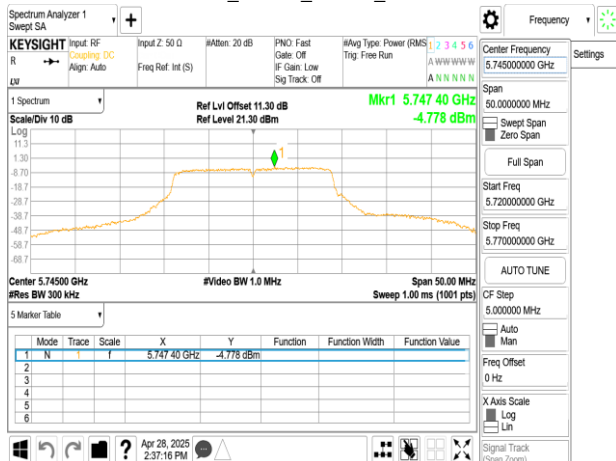
802.11n_20MHz_Chain0_5720MHz_UNI13



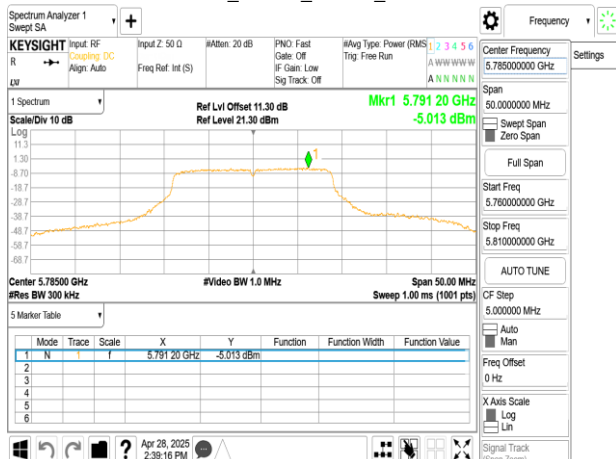
802.11n_20MHz_Chain0_5825MHz



802.11n_20MHz_Chain0_5745MHz



802.11n_20MHz_Chain0_5785MHz



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11 UNDESIRABLE RADIATED EMISSION MEASUREMENT

11.1 Standard Applicable

$EIRP = (E^2 \cdot d^2) / 30$, where E is the field strength in V/m, d is the measurement distance (3m), $EIRP$ is the equivalent isotropically radiated power in Watts.

11.1.1 5150~5850 MHz

Applicable to	Operation Freq. (MHz)	EIRP		Field Strength @ 3m (dBμV/m)
		Freq. (MHz)	Limits (dBm/MHz)	
15.407(b)(1) RSS-247 §6.2.1.2	5150~5250	$f \leq 5150$ $f \geq 5350$	PK: -27	PK: 68.2
15.407(b)(2) RSS-247 §6.2.2.2	5250~5350			
15.407(b)(3) RSS-247 §6.2.3.2	5475~5725	$f \leq 5470$ $f \geq 5725$		
15.407(b)(4)(i) RSS-247 §6.2.4.3	5725~5850	at 75 MHz or more above or below the band edge	PK:-27	PK: 68.2
		increasing linearly from 75~25MHz above or below the band edge	PK:-27~10	PK: 68.2~105.2
		increasing linearly from 25~5MHz above or below the band edge	PK:10~15.6	PK: 105.2~110.8
		increasing linearly from 5~0 MHz above or below the band edge	PK: 15.6~27	PK:110.8~122.2

11.1.2 Spurious Emission

Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

- The lower limit shall apply at the transition frequencies.

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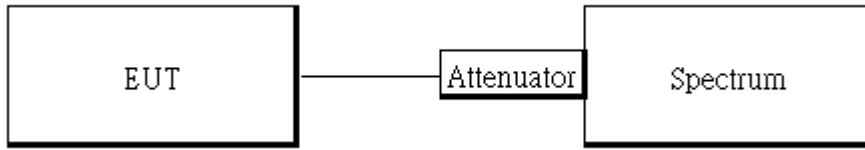
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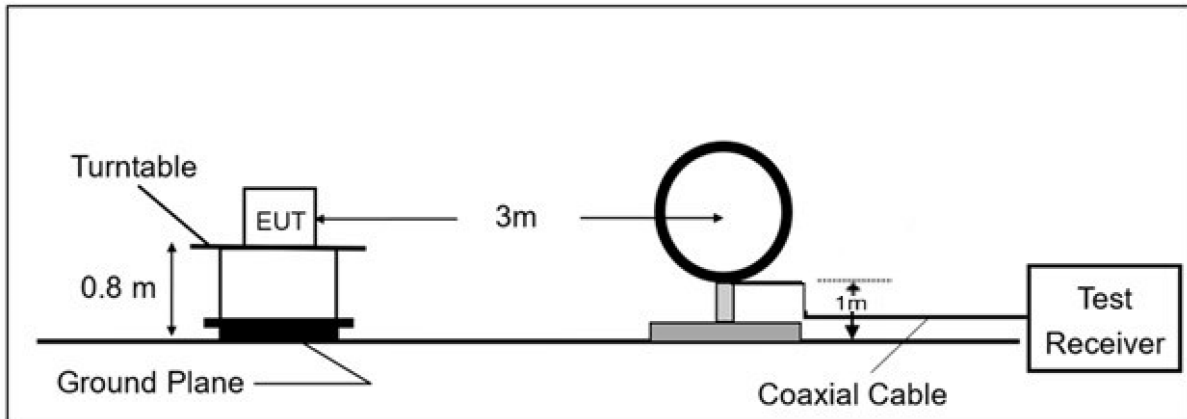
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11.2 Bandedge & Emission

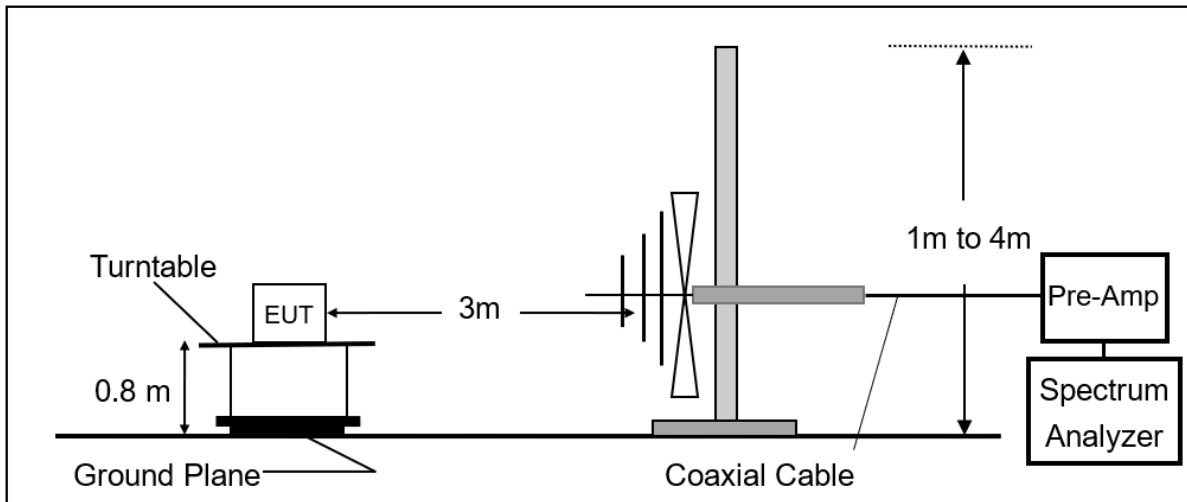


11.3 Test Setup

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz



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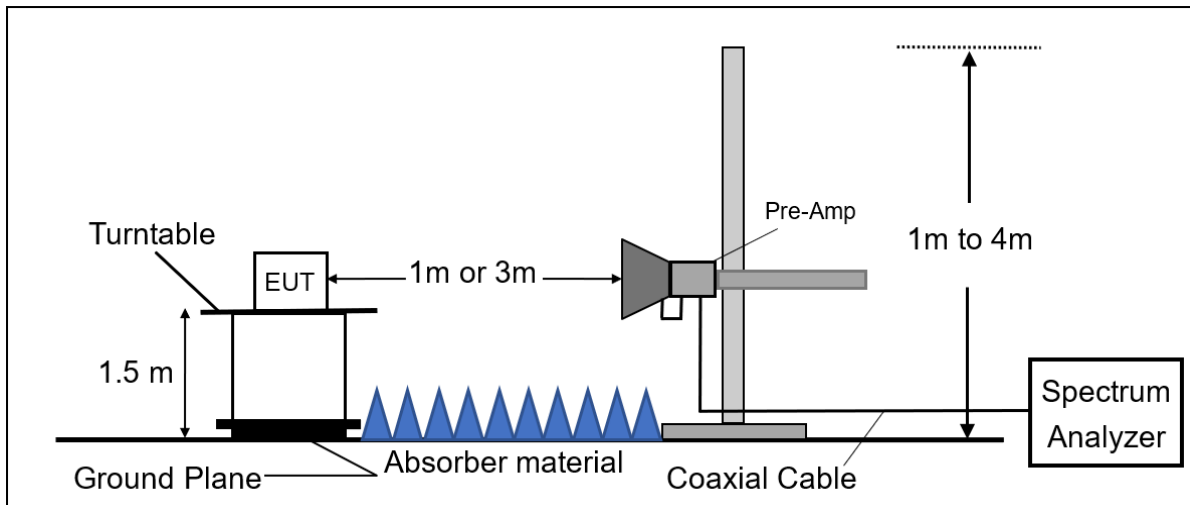
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(C) Radiated Emission Test Set-Up, Frequency Above 1GHz



11.4 Radiated Measurement Procedure

1. The testing follows FCC KDB 789033 D02.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

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12. Repeat above procedures until all frequency measured were complete.

11.5 Band edge Measurement Procedure

1. The testing follows FCC KDB 789033 D02.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
3. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz, Detector = Peak, Sweep time = No faster than coupled (auto) time, Trace mode = max-hold, allow sweeps to continue until the trace stabilizes for Maximum Emission Measurements. (Note that the required measurement time and number of sweep points may be lengthened for low duty cycle applications.)
4. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz, Detector = Peak, Sweep time = AUTO, Trace mode = max-hold, allow sweeps to continue until the trace stabilizes for Average Emission Measurements. (Note that the required measurement time and number of sweep points may be lengthened for low duty cycle applications.)
5. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle.

11.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where *FS* = Field Strength *CL* = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude *AG* = Amplifier Gain
AF = Antenna Factor

The limit of the emission level is expressed in dBuV/m, which converts $20 \cdot \log(uV/m)$

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dB/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

11.7 Test Results of Radiated Spurious Emissions from 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

Pre-scan was done at frequency 5.47 GHz and 5.85 GHz for bandedge measurement of straddle channels 138, 142 and 144 which was 20dB lower than the limit per 15.31(o) was not reported.

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11.8 Measurement Result

11.8.1 CBE

802.11a

Channel	Frequency (MHz)	Duty factor (dB)	Raw Value(dBm)	Antenna Peak	EIRP (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
			Chain 0	Chain 0					
36	5180	N/A	-43.37	3.000	-40.37	54.83	-19.17	74	PK
		0.00	-52.67	3.000	-49.67	45.53	-8.47	54	AV
64	5320	N/A	-42.85	3.090	-39.76	55.44	-18.56	74	PK
		0.00	-53.40	3.090	-50.31	44.89	-9.11	54	AV
100	5500	N/A	-49.24	3.430	-45.81	49.39	-24.61	74	PK
		0.00	-58.17	3.430	-54.74	40.46	-13.54	54	AV
		N/A	-42.25	3.430	-38.82	56.38	-11.82	68.2	PK
140	5700	N/A	-41.48	3.430	-38.05	57.15	-11.05	68.2	PK
144	5720	N/A	-51.74	3.430	-48.31	46.89	-27.11	74	PK
		0.00	-61.50	3.430	-58.07	37.13	-16.87	54	AV
		N/A	-52.31	3.430	-48.88	46.32	-21.88	68.2	PK
		N/A	-52.35	3.430	-48.92	46.28	-21.92	68.2	PK
149	5745	N/A	-51.49	3.280	-48.21	46.99	-21.21	68.2	PK
		N/A	-48.54	3.280	-45.26	49.94	-55.26	105.2	PK
		N/A	-39.32	3.280	-36.04	59.16	-51.64	110.8	PK
		N/A	-30.47	3.280	-27.19	68.01	-54.19	122.2	PK
165	5825	N/A	-39.02	3.280	-35.74	59.46	-62.74	122.2	PK
		N/A	-41.76	3.280	-38.48	56.72	-54.08	110.8	PK
		N/A	-50.87	3.280	-47.59	47.61	-57.59	105.2	PK
		N/A	-53.17	3.280	-49.89	45.31	-22.89	68.2	PK

802.11n 20M

Channel	Frequency (MHz)	Duty factor (dB)	Raw Value(dBm)	Antenna Peak	EIRP Combine (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
			Chain 0	Chain 0					
36	5180	N/A	-42.28	3.000	-39.28	55.92	-18.08	74	PK
		0.00	-52.08	3.000	-49.08	46.12	-7.88	54	AV
64	5320	N/A	-43.58	3.090	-40.49	54.71	-19.29	74	PK
		0.00	-52.98	3.090	-49.89	45.31	-8.69	54	AV
100	5500	N/A	-49.52	3.430	-46.09	49.11	-24.89	74	PK
		0.00	-58.08	3.430	-54.65	40.55	-13.45	54	AV
		N/A	-40.66	3.430	-37.23	57.97	-10.23	68.2	PK
140	5700	N/A	-33.33	3.430	-29.90	65.30	-2.90	68.2	PK
144	5720	N/A	-51.70	3.430	-48.27	46.93	-27.07	74	PK
		0.00	-61.55	3.430	-58.12	37.08	-16.92	54	AV
		N/A	-52.08	3.430	-48.65	46.55	-21.65	68.2	PK
		N/A	-52.81	3.430	-49.38	45.82	-22.38	68.2	PK
149	5745	N/A	-51.22	3.280	-47.94	47.26	-20.94	68.2	PK
		N/A	-49.62	3.280	-46.34	48.86	-56.34	105.2	PK
		N/A	-37.98	3.280	-34.70	60.50	-50.30	110.8	PK
		N/A	-30.10	3.280	-26.82	68.38	-53.82	122.2	PK
165	5825	N/A	-33.49	3.280	-30.21	64.99	-57.21	122.2	PK
		N/A	-40.19	3.280	-36.91	58.29	-52.51	110.8	PK
		N/A	-51.62	3.280	-48.34	46.86	-58.34	105.2	PK
		N/A	-52.49	3.280	-49.21	45.99	-22.21	68.2	PK

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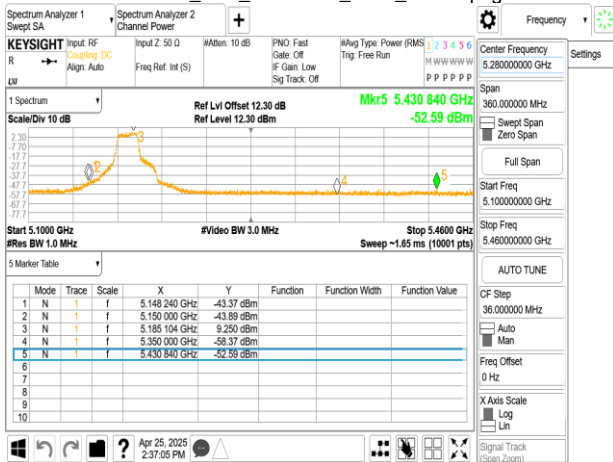
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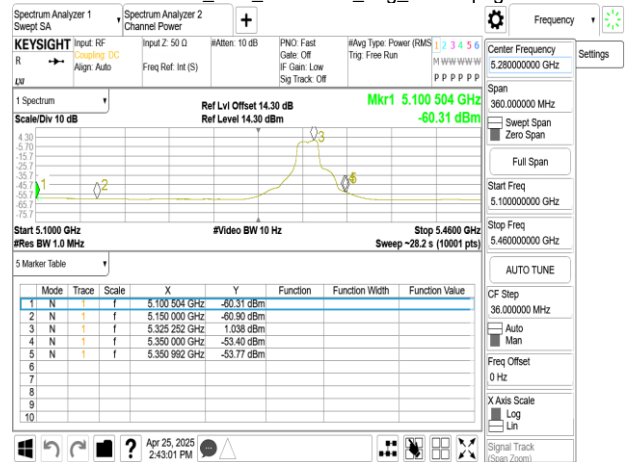
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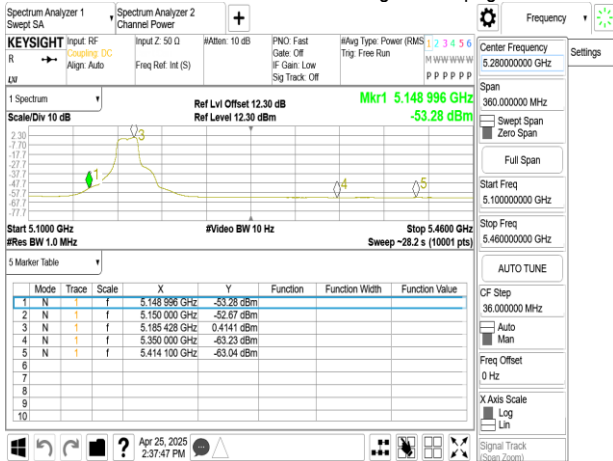
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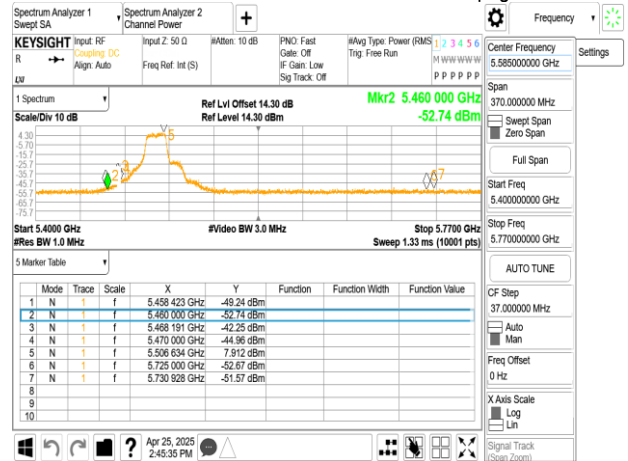
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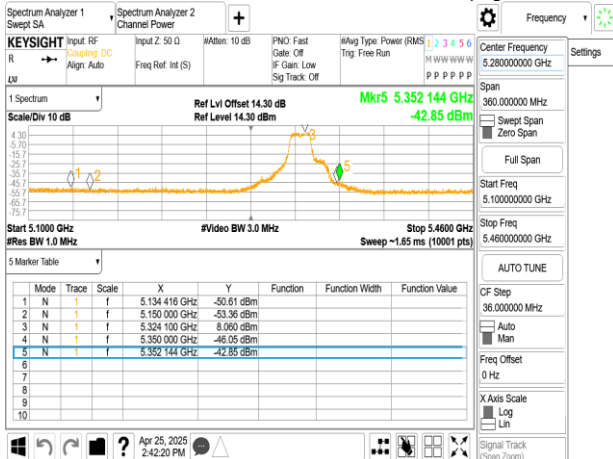
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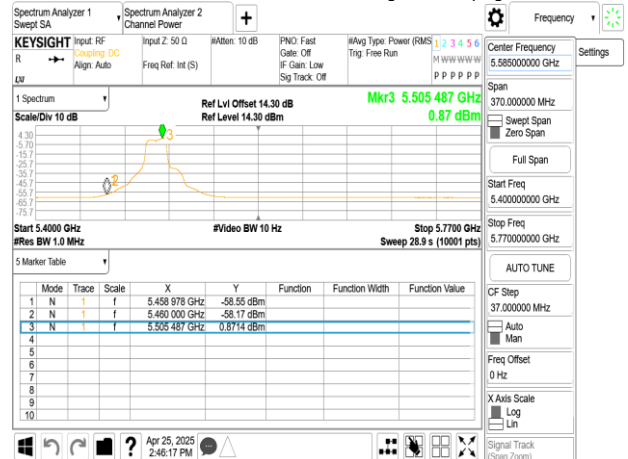
802.11a_20M_5500 MHz_Peak_chain0.png



802.11a_20M_5320 MHz_Peak_chain0.png



802.11a_20M_5500 MHz_Avg_chain0.png

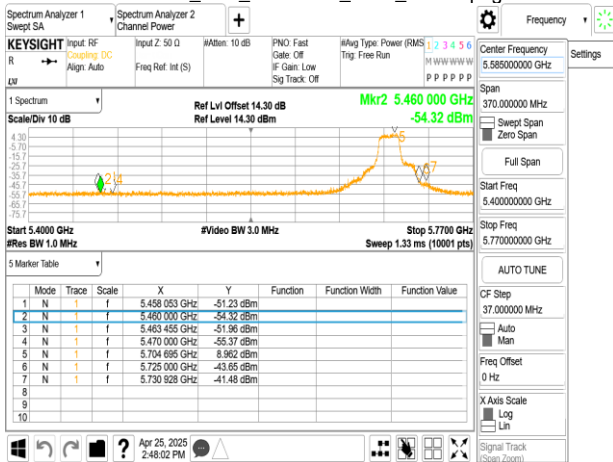


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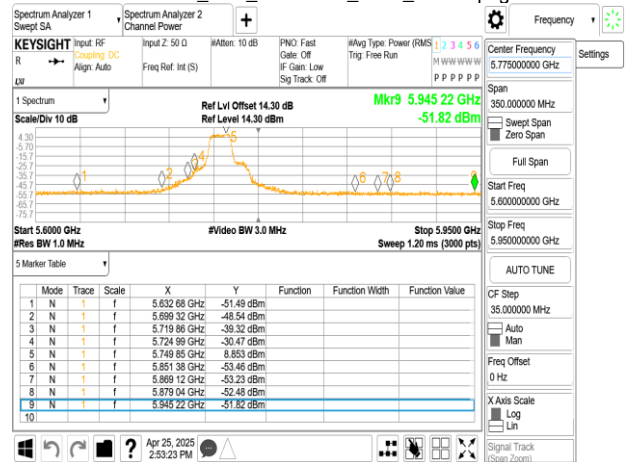
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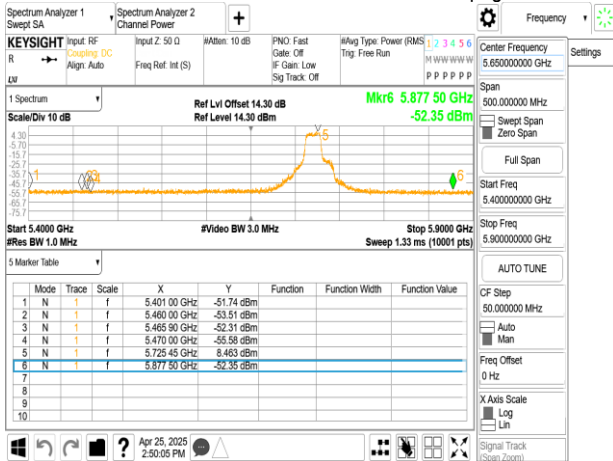
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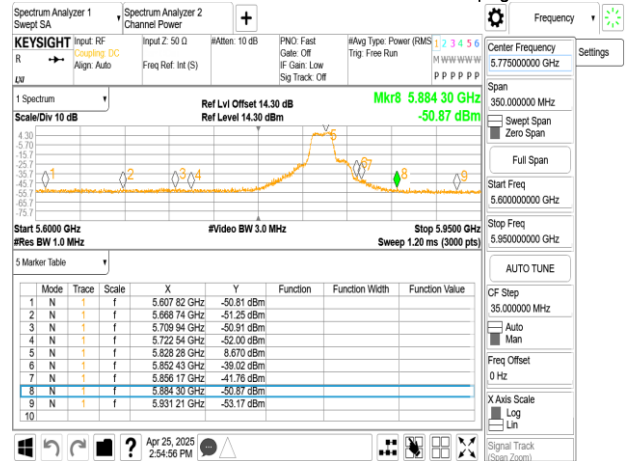
802.11a_20M_5745 MHz_Peak_chain0.png



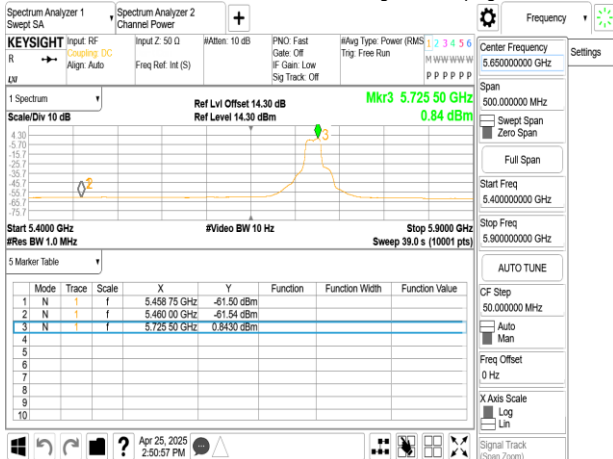
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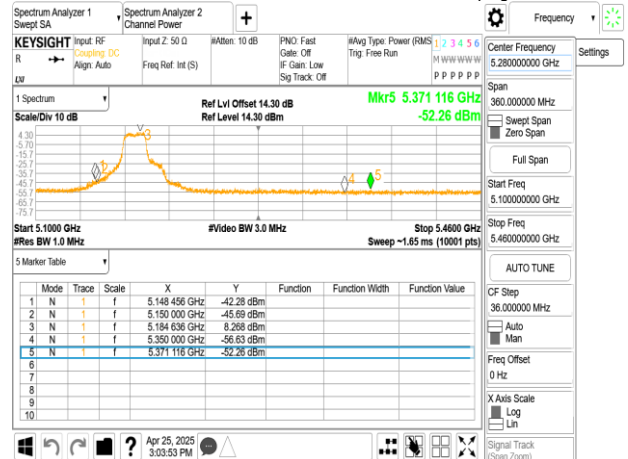
802.11a_20M_5825 MHz_Peak_chain0.png



802.11a_20M_5720 MHz_Avg_chain0.png



802.11n_20M_5180 MHz_Peak_chain0.png

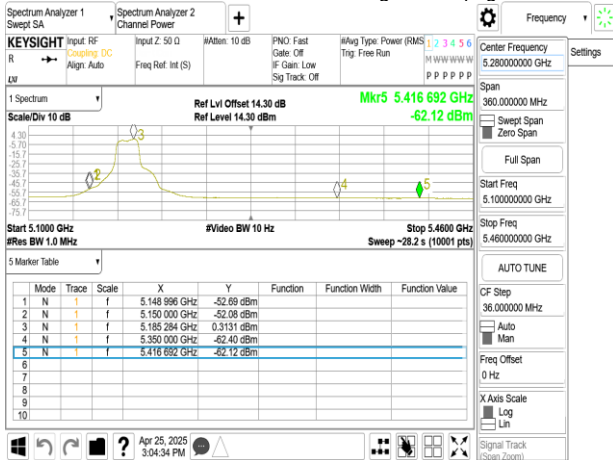


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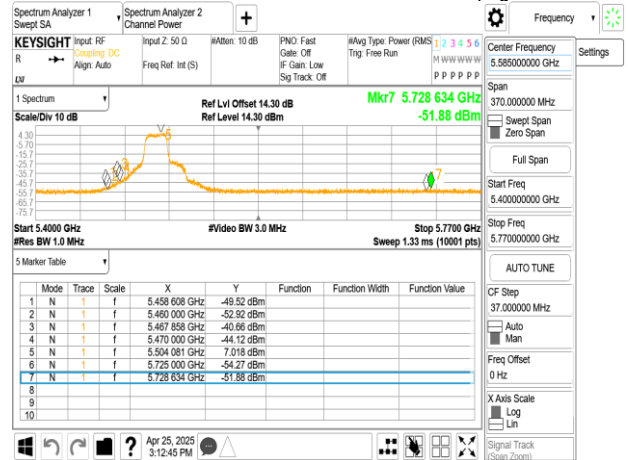
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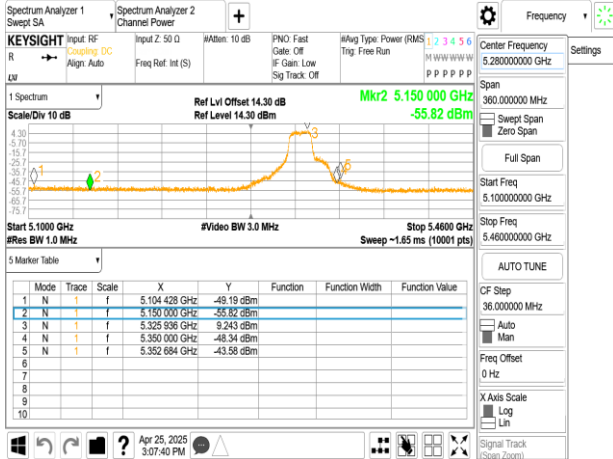
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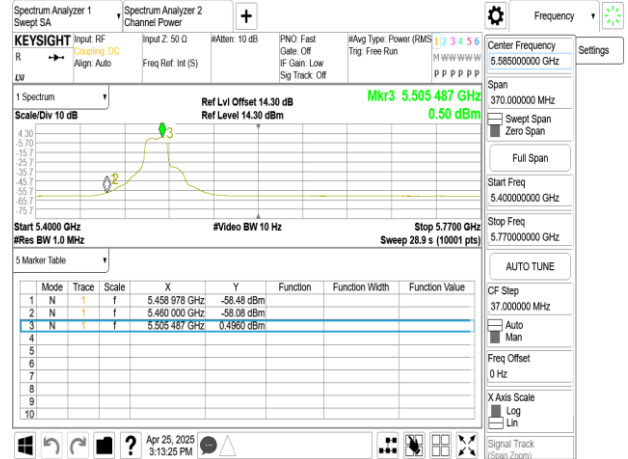
802.11n_20M_5500 MHz_Peak_chain0.png



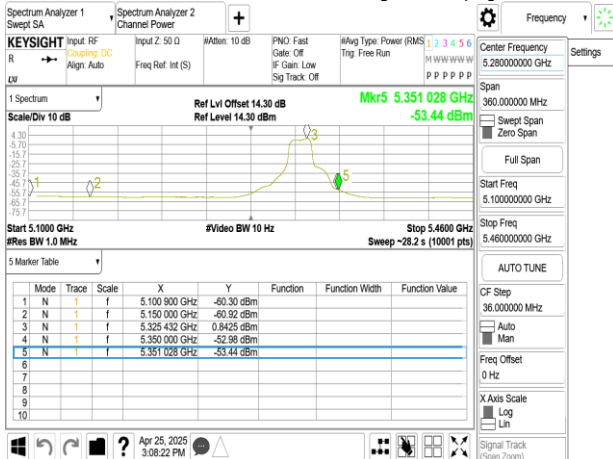
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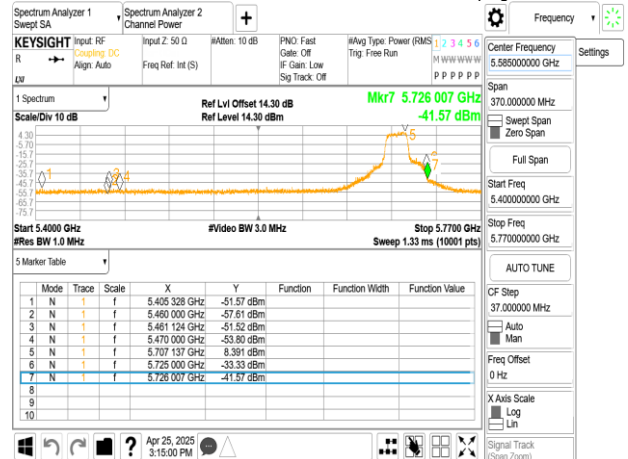
802.11n_20M_5500 MHz_Avg_chain0.png



802.11n_20M_5320 MHz_Avg_chain0.png



802.11n_20M_5700 MHz_Peak_chain0.png

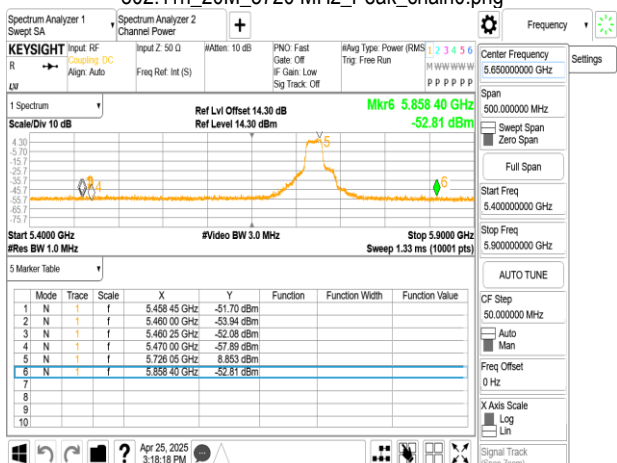


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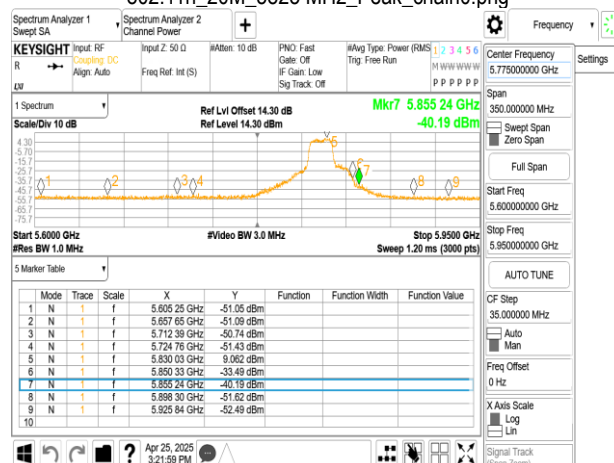
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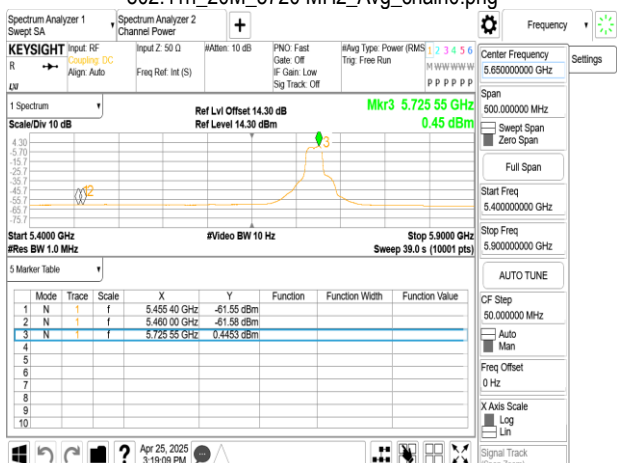
802.11n_20M_5720 MHz_Peak_chain0.png



802.11n_20M_5825 MHz_Peak_chain0.png



802.11n_20M_5720 MHz_Avg_chain0.png



802.11n_20M_5745 MHz_Peak_chain0.png



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11.8.2 Conducted Emission (30MHz~1GHz)

802.11a

Channel	Frequency (MHz)	Raw Value(dBm)	Correction Factor (dB)	EIRP (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
		Chain 0						
44	5220	-71.670	7.70	-63.97	31.23	-8.77	40	PK
		-71.180	7.70	-63.48	31.72	-11.78	43.5	PK
		-69.390	7.70	-61.69	33.51	-12.49	46	PK
		-69.790	7.70	-62.09	33.11	-20.89	54	PK
		-69.430	7.70	-61.73	33.47	-12.53	46	PK
		-69.530	7.70	-61.83	33.37	-12.63	46	PK
60	5300	-70.710	7.79	-62.92	32.28	-7.72	40	PK
		-70.810	7.79	-63.02	32.18	-11.32	43.5	PK
		-68.400	7.79	-60.61	34.59	-11.41	46	PK
		-69.850	7.79	-62.06	33.14	-20.86	54	PK
		-69.350	7.79	-61.56	33.64	-12.36	46	PK
		-69.530	7.79	-61.74	33.46	-12.54	46	PK
116	5580	-70.840	8.13	-62.71	32.49	-7.51	40	PK
		-70.940	8.13	-62.81	32.39	-11.11	43.5	PK
		-68.890	8.13	-60.76	34.44	-11.56	46	PK
		-70.070	8.13	-61.94	33.26	-20.74	54	PK
		-69.430	8.13	-61.30	33.90	-12.10	46	PK
		-69.510	8.13	-61.38	33.82	-12.18	46	PK
157	5785	-71.340	7.98	-63.36	31.84	-8.16	40	PK
		-70.740	7.98	-62.76	32.44	-11.06	43.5	PK
		-68.840	7.98	-60.86	34.34	-11.66	46	PK
		-69.390	7.98	-61.41	33.79	-20.21	54	PK
		-69.020	7.98	-61.04	34.16	-11.84	46	PK
		-69.040	7.98	-61.06	34.14	-11.86	46	PK

Note:

Correction Factor=maximum ground reflection factor+Antenna Gain

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(1~40GHz)

802.11a

Channel	Frequency (MHz)	Duty factor (dB)	Raw Value(dBm)	Antenna Peak	EIRP (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
			Chain 0	Chain 0					
36	5180	N/A	-38.58	3.000	-35.58	59.62	-8.58	68.2	PK
		N/A	-50.75	3.000	-47.75	47.45	-26.55	74	PK
		0.00	-60.47	3.000	-57.47	37.73	-16.27	54	AV
44	5220	N/A	-37.36	3.000	-34.36	60.84	-7.36	68.2	PK
		N/A	-50.35	3.000	-47.35	47.85	-26.15	74	PK
		0.00	-60.31	3.000	-57.31	37.89	-16.11	54	AV
48	5240	N/A	-38.46	3.000	-35.46	59.74	-8.46	68.2	PK
		N/A	-50.03	3.000	-47.03	48.17	-25.83	74	PK
		0.00	-60.22	3.000	-57.22	37.98	-16.02	54	AV
52	5260	N/A	-38.63	3.090	-35.54	59.66	-8.54	68.2	PK
		N/A	-49.87	3.090	-46.78	48.42	-25.58	74	PK
		0.00	-60.48	3.090	-57.39	37.82	-16.19	54	AV
60	5300	N/A	-50.81	3.090	-47.72	47.48	-26.52	74	PK
		0.00	-60.61	3.090	-57.52	37.68	-16.32	54	AV
64	5320	N/A	-49.47	3.090	-46.38	48.82	-25.18	74	PK
		0.00	-60.46	3.090	-57.37	37.83	-16.17	54	AV
100	5500	N/A	-43.28	3.430	-39.85	55.35	-18.65	74	PK
		0.00	-50.91	3.430	-47.48	47.72	-6.28	54	AV
		N/A	-46.43	3.430	-43.00	52.20	-16.00	68.2	PK
116	5580	N/A	-45.61	3.430	-42.18	53.02	-20.98	74	PK
		0.00	-53.37	3.430	-49.94	45.26	-8.74	54	AV
		N/A	-46.67	3.430	-43.24	51.96	-16.24	68.2	PK
140	5700	N/A	-50.52	3.430	-47.09	48.11	-25.89	74	PK
		0.00	-60.41	3.430	-56.98	38.22	-15.78	54	AV
		N/A	-46.87	3.430	-43.44	51.76	-16.44	68.2	PK
144	5720	N/A	-50.36	3.430	-46.93	48.27	-25.73	74	PK
		0.00	-60.41	3.430	-56.98	38.22	-15.78	54	AV
		N/A	-47.47	3.430	-44.04	51.16	-17.04	68.2	PK
149	5745	N/A	-50.81	3.280	-47.53	47.67	-26.33	74	PK
		0.00	-60.49	3.280	-57.21	37.99	-16.01	54	AV
		N/A	-47.12	3.280	-43.84	51.36	-16.84	68.2	PK
157	5785	N/A	-49.92	3.280	-46.64	48.56	-25.44	74	PK
		0.00	-60.43	3.280	-57.15	38.05	-15.95	54	AV
		N/A	-45.96	3.280	-42.68	52.52	-15.68	68.2	PK
165	5825	N/A	-50.48	3.280	-47.20	48.00	-26.00	74	PK
		0.00	-60.54	3.280	-57.26	37.94	-16.06	54	AV
		N/A	-46.89	3.280	-43.61	51.59	-16.61	68.2	PK

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802.11n 20M

Channel	Frequency (MHz)	Duty factor (dB)	Raw Value(dBm)		Antenna Peak	EIRP (dBm)	Emission Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	
			Chain 0	Chain 0						
36	5180	N/A	-38.76	3.000	-35.76	59.44	-8.76	68.2	74	PK
		N/A	-49.80	3.000	-46.80	48.40	-25.60	74	74	PK
		0.00	-60.51	3.000	-57.51	37.69	-16.31	54	54	AV
44	5220	N/A	-38.97	3.000	-35.97	59.23	-8.97	68.2	74	PK
		N/A	-50.62	3.000	-47.62	47.58	-26.42	74	74	PK
		0.00	-60.45	3.000	-57.45	37.75	-16.25	54	54	AV
48	5240	N/A	-38.38	3.000	-35.38	59.82	-8.38	68.2	74	PK
		N/A	-50.87	3.000	-47.87	47.33	-26.67	74	74	PK
		0.00	-60.34	3.000	-57.34	37.86	-16.14	54	54	AV
52	5260	N/A	-39.23	3.090	-36.14	59.06	-9.14	68.2	74	PK
		N/A	-50.92	3.090	-47.83	47.37	-26.63	74	74	PK
		0.00	-60.50	3.090	-57.41	37.79	-16.21	54	54	AV
60	5300	N/A	-49.47	3.090	-46.38	48.82	-25.18	74	74	PK
		0.00	-60.32	3.090	-57.23	37.97	-16.03	54	54	AV
64	5320	N/A	-49.20	3.090	-46.11	49.09	-24.91	74	74	PK
		0.00	-60.39	3.090	-57.30	37.90	-16.10	54	54	AV
100	5500	N/A	-42.53	3.430	-39.10	56.10	-17.90	74	74	PK
		0.00	-50.96	3.430	-47.53	47.67	-6.33	54	54	AV
		N/A	-46.75	3.430	-43.32	51.88	-16.32	68.2	74	PK
116	5580	N/A	-45.41	3.430	-41.98	53.22	-20.78	74	74	PK
		0.00	-53.49	3.430	-50.06	45.14	-8.86	54	54	AV
		N/A	-47.00	3.430	-43.57	51.63	-16.57	68.2	74	PK
140	5700	N/A	-50.27	3.430	-46.84	48.36	-25.64	74	74	PK
		0.00	-60.22	3.430	-56.79	38.41	-15.59	54	54	AV
		N/A	-47.00	3.430	-43.57	51.63	-16.57	68.2	74	PK
144	5720	N/A	-50.46	3.430	-47.03	48.17	-25.83	74	74	PK
		0.00	-60.43	3.430	-57.00	38.20	-15.80	54	54	AV
		N/A	-47.24	3.430	-43.81	51.39	-16.81	68.2	74	PK
149	5745	N/A	-48.93	3.280	-45.65	49.55	-24.45	74	74	PK
		0.00	-60.39	3.280	-57.11	38.09	-15.91	54	54	AV
		N/A	-46.82	3.280	-43.54	51.66	-16.54	68.2	74	PK
157	5785	N/A	-49.82	3.280	-46.54	48.66	-25.34	74	74	PK
		0.00	-60.59	3.280	-57.31	37.89	-16.11	54	54	AV
		N/A	-46.59	3.280	-43.31	51.89	-16.31	68.2	74	PK
165	5825	N/A	-50.51	3.280	-47.23	47.97	-26.03	74	74	PK
		0.00	-60.34	3.280	-57.06	38.14	-15.86	54	54	AV
		N/A	-47.38	3.280	-44.10	51.10	-17.10	68.2	74	PK

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f (886-2) 2298-0488

www.sgs.com.tw

Member of SGS Group

Peak (30MHz~1GHz)

802.11a_20MHz_Chain0_5220MHz_0.03-1GHz



802.11a_20MHz_Chain0_5785MHz_0.03-1GHz



802.11a_20MHz_Chain0_5300MHz_0.03-1GHz



802.11a_20MHz_Chain0_5580MHz_0.03-1GHz



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SGS Taiwan Ltd.

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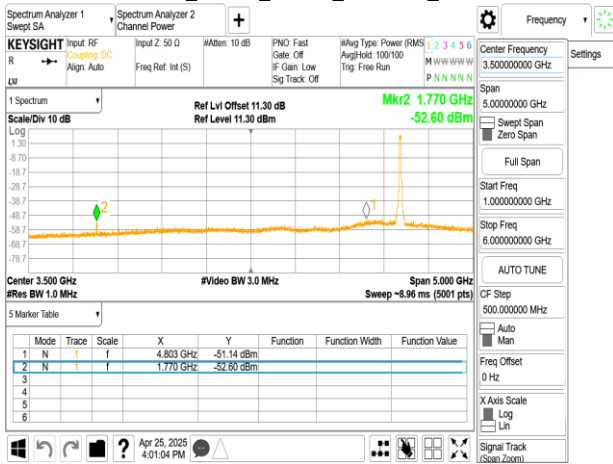
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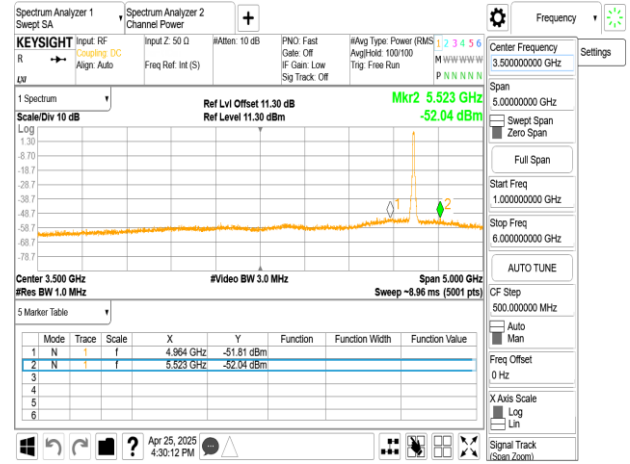
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Peak (1~40GHz)

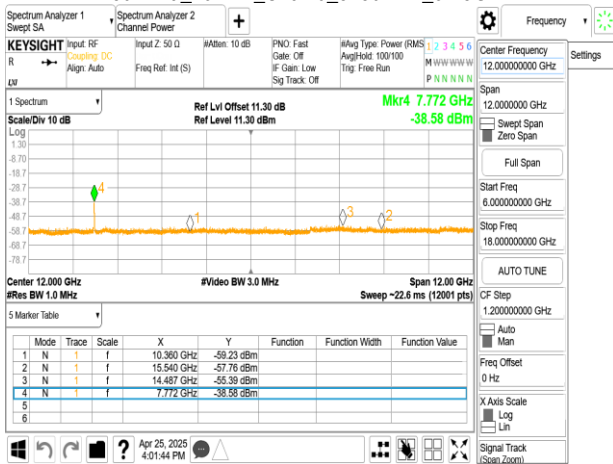
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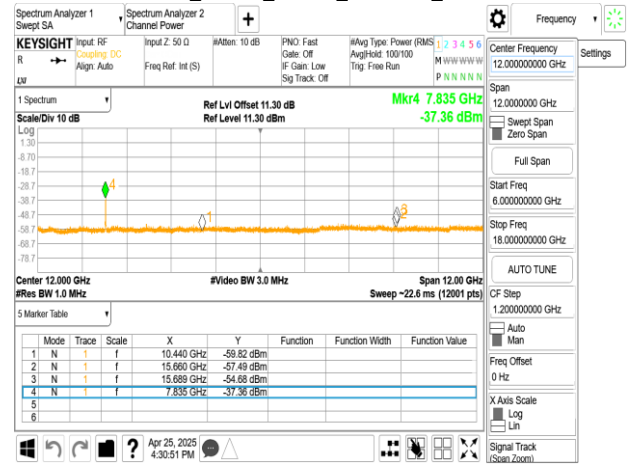
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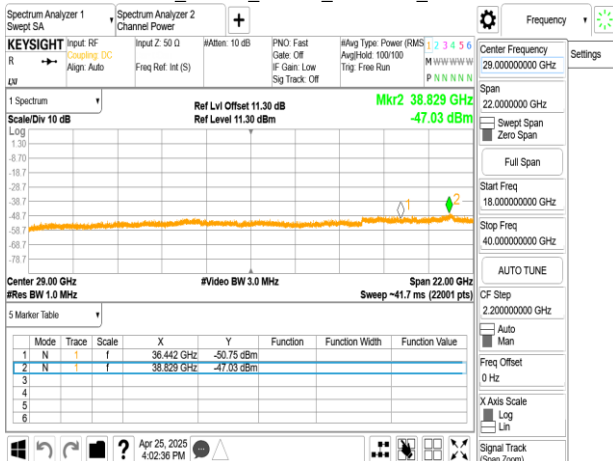
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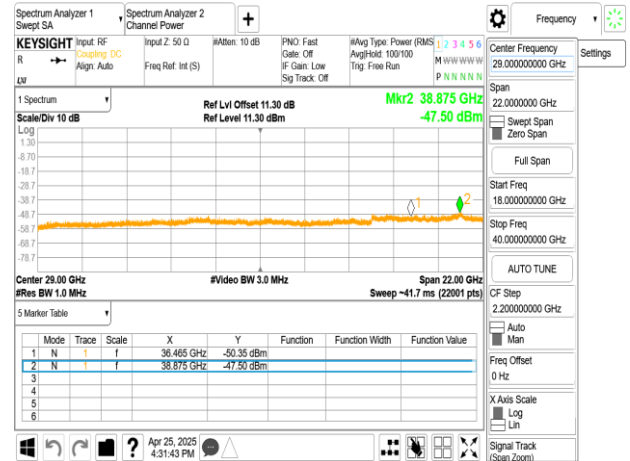
802.11a_20MHz_Chain0_5220MHz_6-18GHz



802.11a_20MHz_Chain0_5180MHz_18-40GHz



802.11a_20MHz_Chain0_5220MHz_18-40GHz



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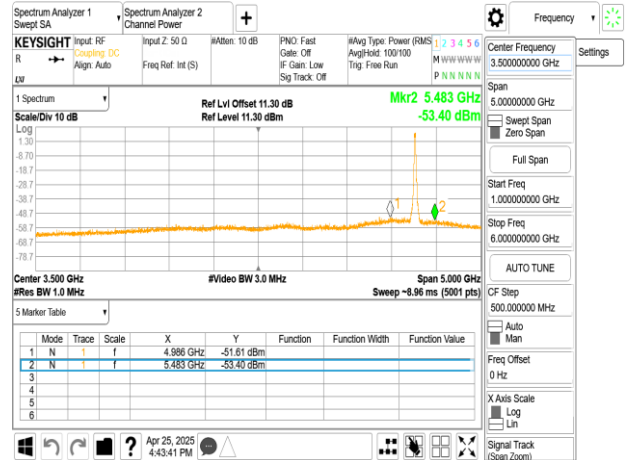
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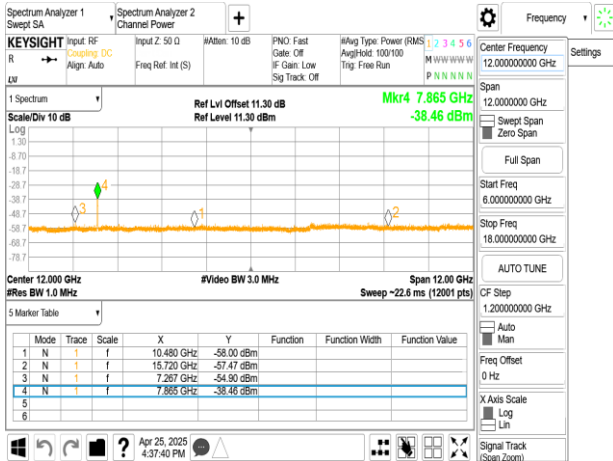
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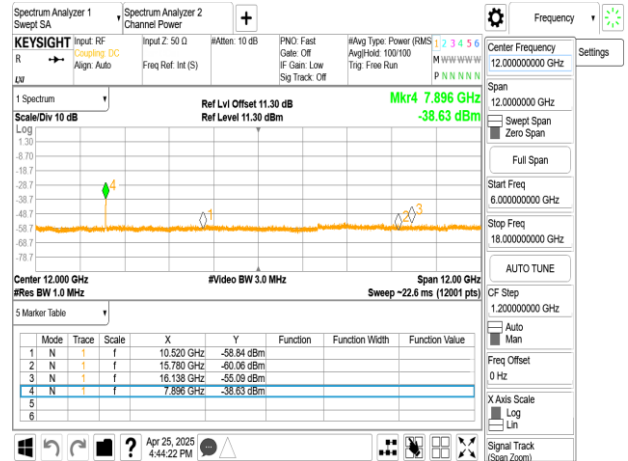
802.11a_20MHz_Chain0_5260MHz_1-6GHz



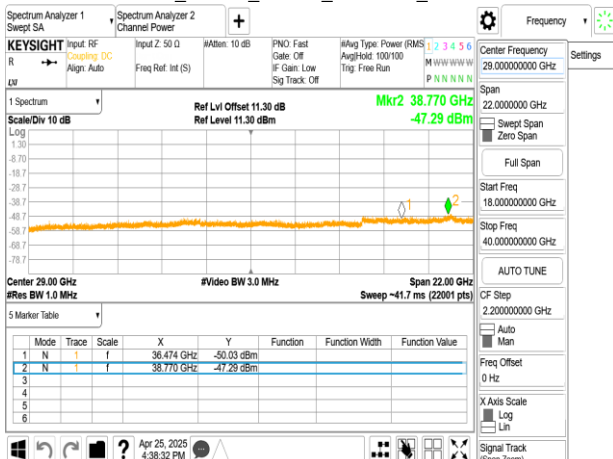
802.11a_20MHz_Chain0_5240MHz_6-18GHz



802.11a_20MHz_Chain0_5260MHz_6-18GHz



802.11a_20MHz_Chain0_5240MHz_18-40GHz



802.11a_20MHz_Chain0_5260MHz_18-40GHz

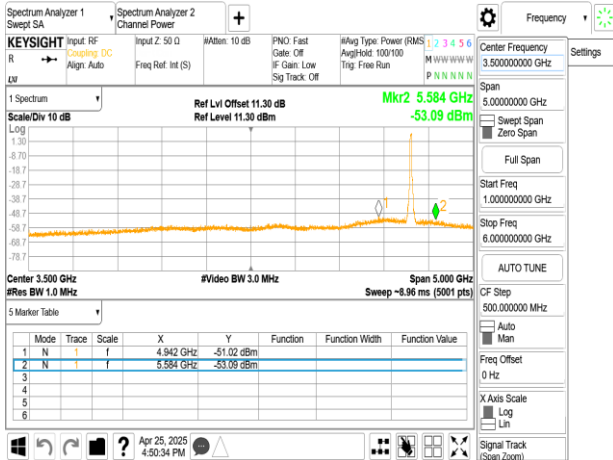


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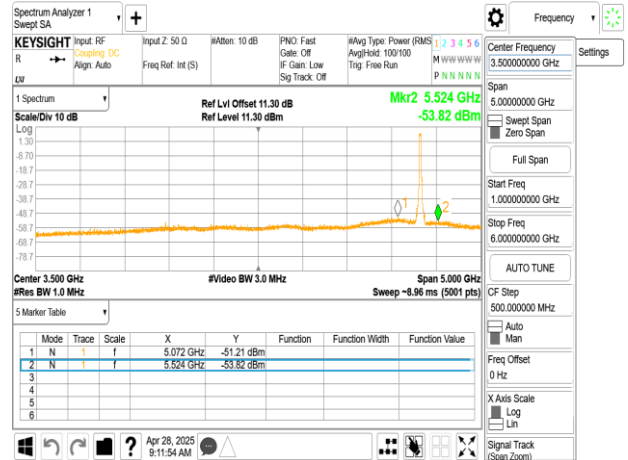
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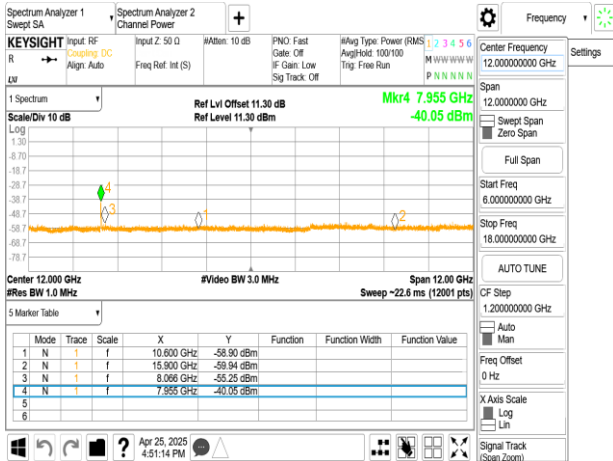
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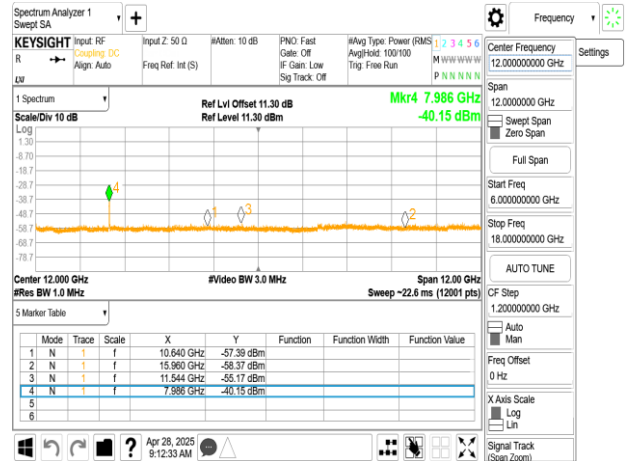
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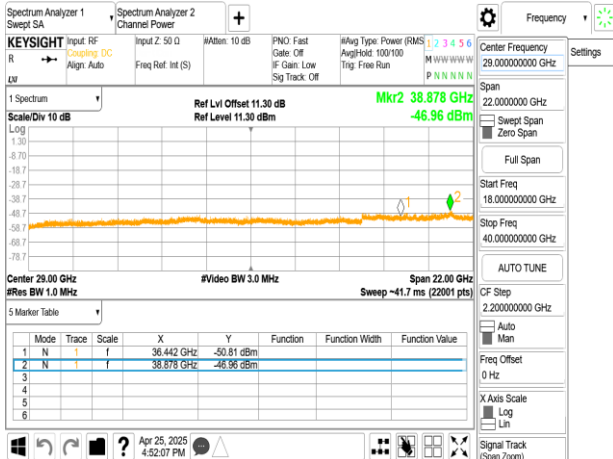
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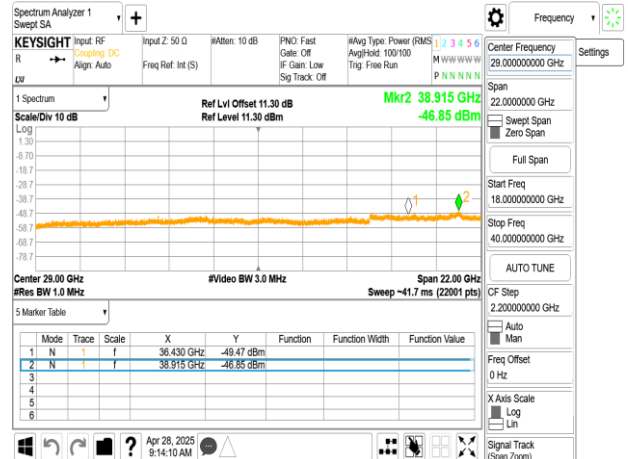
802.11a_20MHz_Chain0_5320MHz_6-18GHz



802.11a_20MHz_Chain0_5300MHz_18-40GHz



802.11a_20MHz_Chain0_5320MHz_18-40GHz



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